GIL CONDON

INSTRUCTION MANUAL

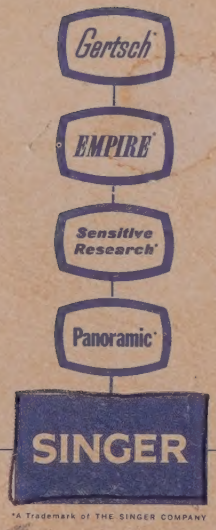
Engineering Lab

EMPIRE*

TUNING UNIT

150 KC TO 30 MC

MODEL TA/NF-105



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Precision electrical and electronic instruments for measurement

THE SINGER COMPANY • METRICS DIVISION

INSTRUCTION MANUAL

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*Sensitive Research** Electrical Indicating Instruments.....2 years
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Repair or replacement (at our option) without charge (F.O.B. factory) will be effected when our examination satisfactorily indicates that defects are due to workmanship or materials. Electron tubes, semiconductors, batteries, fuzes, lamps, thermoelements, and *RatioTran** potentiometers are excluded from warranty coverage. Warranty returns must first be authorized by the factory.

If the instrument or any portion thereof, has been abused, misused, damaged by accident or negligence, or if any serial number or seal has been removed or altered, the warranty is void.

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1. Model or Type
2. Serial Number
3. Description of trouble(2)
4. Test instruments used
5. Approximate date instrument was placed in operation
6. Approximate number of hours of use
7. Has maintenance action been previously requested?
8. Other comments

Upon receipt of this information our Service Department will send you service data or shipping instructions. Upon receipt of shipping instructions forward the instrument to the factory prepaid. If requested, an estimate of charges will be made before work begins.

(1) Contact Metrics Division, Bridgeport, Connecticut for *Commander**, *Empire**, *Panoramic**, and *Sensitive Research** instruments. Contact Metrics Division, Los Angeles, California for *Gertsch** instruments.

(2) Include data on symptoms, measurements taken, suspected location of trouble, maintenance action taken, and any other relevant data.

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METRICS DIVISION
915 Pembroke Street
Bridgeport 8, Conn.

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1. General

Tuning Unit T-A/NF-105 covers the frequency range from 150 KC to 30 MC by means of six bands.

Its calibration method differs from T-1/NF-105 and T-2/NF-105, the 20-400 MC ranges, in that, in addition to the peak calibration, the carrier calibration also is performed by means of the impulse noise generator.

The procedure for peak calibration is identical to that used for the 20-1000 MC ranges, and is described in detail in the instruction manual for the NF-105, Carrier (CW) calibration is performed by means of the impulse generator. This procedure is possible since both the level of the impulse generator and the bandwidth of the receiver are known. The bandwidth of the receiver must be considered because the impulse noise sensitivity of the receiver is a function of the receiver bandwidth. If, for instance, the receiver had a bandwidth of one megacycle, its CW sensitivity in microvolts would equal its impulse sensitivity expressed in microvolts per megacycle bandwidth. If the receiver bandwidth were only 0.1 megacycle, the impulse noise calibrating voltage required for the previous CW sensitivity adjustment of the receiver, would have to be increased by a factor of 10. The Calibration chart (Figure 1) indicates the equivalent impulse level required to produce a full scale deflection of 100 microvolts of carrier (CW) voltage.

The noise bandwidth of Tuning Unit Model T-A/NF-105 is approximately 10 KC. The exact value of bandwidth (in Megacycles) for any frequency may be determined by referring to the calibration chart shown in Figure 1 and dividing the carrier sensitivity (100 uv) by the equivalent impulse level.

For example: $\frac{100 \text{ uv}}{80 \text{ DBMc}} - \frac{100 \text{ uv}}{10,000 \text{ uv}} = 0.01 \text{ MC} = 10 \text{ KC}$

2. Accessories

a. Switching Unit SU-105

b. Antenna Equipment LM-105- Including the following items:

Carrying Case	LC-105
Loop Antenna	LP-105
Vertical Antenna	VA-105
Magnetic Probe	LO-105
Line Probe (50 ohms)	LA-105
Line Probe (500 ohms)	LF-105
High Impedance Binding Post	PA-105

1. General

Tuning Unit T-A/NP-105 covers the frequency range from 150 KC to 30 MC by means of six bands.

Its calibration method differs from T-1/NP-105 and T-4/NP-105, the 20-400 MC ranges, in that, in addition to the peak calibration, the carrier calibration also is performed by means of the impulse noise generator.

The procedure for peak calibration is identical to that used for the 20-1000 MC ranges, and is described in detail in the instruction manual for the NP-105. Carrier (CW) calibration is performed by means of the impulse generator and the bandwidth of the receiver are known. The bandwidth of the receiver must be considered because the impulse noise sensitivity of the receiver is a function of the receiver bandwidth. It, for instance, the receiver had a bandwidth of one megacycle, its CW sensitivity in microvolts would equal its impulse sensitivity expressed in microvolts per megacycle bandwidth. If the receiver bandwidth were only 0.1 megacycle, the impulse noise calibrating voltage required for the previous CW sensitivity adjustment of the receiver, would have to be increased by a factor of 10. The Calibration chart (Figure 1) indicates the equivalent impulse level required to produce a full scale deflection of 100 microvolts of carrier (CW) voltage.

The noise bandwidth of Tuning Unit Model T-A/NP-105 is approximately 10 KC. The exact value of bandwidth (in Megacycles) for any frequency may be determined by referring to the calibration chart shown in Figure 1 and dividing the carrier sensitivity (100 uv) by the equivalent impulse level.

For example: $\frac{100 \text{ uv}}{80 \text{ DBMc}} - \frac{100 \text{ uv}}{10,000 \text{ uv}} = 0,01 \text{ MC} = 10 \text{ KC}$

2. Accessories

a. Switching Unit SU-105

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Carrying Case	LC-105
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Magnetic Probe	LO-105
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Line Probe (500 ohms)	LP-105
High Impedance Binding Post	PA-105

Switching Unit SU-105 enables the operator to feed either the calibrating signal from Impulse Generator or the interference signal from the antenna to the SIGNAL INPUT jack on the front panel by means of a toggle switch rather than by changing cables. This unit is available as an accessory.

The input impedance of the NF-105 for all frequency ranges is 50 ohms. In order to achieve efficient energy transfer from the vertical and the loop antennas, couplers (impedance matching devices) are furnished as part of these antennas. Since the impedance of the antennas is a function of frequency, matching transformers are used for each frequency range of tuning Unit T-A/NF-105.

The vertical antenna VA-105 consists of a 41" collapsible rod mounted on top of its coupler. The coupler contains six autotransformers, whose 50 ohm output, by means of a six position switch, is connected to the antenna receptacle located on the coupler.

Similarly, the loop antenna LP-105 is mounted on a coupler containing the appropriate matching networks. They are also selected for the proper frequency range by means of a six position switch.

Magnetic Field Probe Model LO-105 is similar to Magnetic Field Probe Model MP-105 except that it has more inductance than the latter so as to provide effective low frequency pickup. Since Model LO-105 and MP-105 are of the same physical appearance Magnetic Field Probe Model LO-105 has half its loop painted red to provide a simple means of identification.

Line Probes Model LA-105 and LF-105 are designed for 50 ohms and 500 ohms impedance respectively. They are used in the same manner as Line Probes LL-105 and LH-105, as described in the instruction manual for the higher frequencies.

3. Conducted Measurements (Two Terminal VTVM)

Connect the impulse generator output to the signal input receptacle (located on the Basic Measuring Unit) by means of the 18" cable. In addition, connect the attenuator output to the attenuator output to the corresponding receptacle on the tuning unit by means of the 6" cable. Connect the signal input receptacle to the equipment to be measured as shown in Figure 2 after calibration has been performed.

Turn the equipment on and after it has warmed up, adjust the meter balance and zero adjust controls for meter zero. Turn the impulse generator on and adjust its pulse repetition rate to approximately 1,000 cycles per second.

For CW measurement adjust the Impulse Generator output controls to the value indicated for the desired frequency (see Figure 1).

Set the signal input attenuator to 20 DB. Turn the bandswitch on the tuning unit to the proper frequency range and tune to the desired frequency. Turn the function switch to its peak setting and adjust the gain control for full scale indication on the large meter.

The instrument now has a full scale sensitivity of 100 microvolts (CW) as a two-terminal vacuum tube voltmeter. By changing the attenuator setting 0, 40, 60 or 80 DB the sensitivity is changed to 10, 1,000, 10,000 or 100,000 microvolts full scale, respectively, as shown in the table below. Calibration by means of the impulse noise signal must at all times be made with the function switch in the PEAK position, even though the instrument is being calibrated to be used for carrier measurements.

SIGNAL INPUT ATTENUATOR	FULL SCALE SENSITIVITY
0 DB	10 Microvolts
20 DB	100 Microvolts
40 DB	1000 Microvolts
60 DB	10,000 Microvolts
80 DB	100,000 Microvolts

After the calibration has been performed carrier measurements are normally taken with the function switch in the CARRIER position. Readings must be taken in the PEAK position, however, it the peak value of a modulated carrier is to be measured.

If sensitivity in excess of that produced by the above described calibration procedure is desired, the sensitivity may be increased by 20 DB as follows: Set signal input attenuator to 40 DB instead of 20 DB while calibrating. This procedure increases the full scale sensitivity of the instrumentto 1, 10, 100, 1,000, and 10,000 microvolts respectively depending upon the setting of the signal input attenuator. Therefore, when following this alternate calibration procedure, deduct 20 DB from the indicated reading. In the one microvolt full scale position, correction for residual noise may be applied as indicated in the instruction manual for the NF 105.

For PEAK measurements of broadband noise the substitution method (visual or aural) is used as described in detail in the instruction manual for the NF-105. The readings of broadband noise are always in terms of DB above 1 microvolt per megacycle bandwidth.

4. Radiated Measurements

In order to make radiated measurements, vertical antenna Model VA-105 or loop antenna Model LP-105 are used as pick-up devices. If measurements are conducted in a shielded room, vertical antenna Model VA-105 is commonly employed. Extend the vertical antenna to its full length (41 inches). The base of the coupler must be mounted on a metal plate about 12" square (not furnished), which is bonded to the metal bench top by means of a copper bond strap 12" wide. A typical set-up is shown in Figure 3.

Connect the impulse generator output to the signal input receptacle (located on the Basic Measuring Unit) by means of the 18" cable. In addition, connect the attenuator output to the corresponding receptacle on the tuning unit by means of the 6" cable.

Turn the equipment on and after it has warmed up, adjust the meter balance and meter zero control. Turn the impulse generator on and adjust its pulse repetition rate to approximately 1000 cycles per second.

For CW measurements proceed as follows:
Adjust the impulse generator output controls to the value indicated for the desired frequency (see Figure 1).

Set the signal input attenuator to 40 DB. Turn the bandswitch on the tuning unit to the proper frequency range and tune to the desired frequency. Turn the function switch to its peak setting and adjust the gain control for full scale indication on the large meter. The two terminal sensitivity now becomes as follows:

SIGNAL INPUT ATTEN.	FULL SCALE SENSITIVITY
0DB	1 microvolt
20DB	10 microvolts
40DB	100 microvolts
60DB	1000 microvolts
80DB	10,000 microvolts

The actual level impressed across the input terminals of the instrument will now be 20 DB less than the sum of the signal input attenuator and meter reading.

Disconnect the 18" cable from the signal input receptacle and in its place connect the pick-up device (VA-105) by means of the 30 ft. cable.* Set the bandswitch of the coupler to the desired frequency range.

In order to read narrow band CW radiated signals the antenna factors as shown in Figures 4 or 5 must be applied to the instrument reading. These antenna factors indicate the voltage transformation ratio in the matching transformers necessary to convert the antenna impedance to 50 ohms as required by the input impedance of the instrument. The actual transformation ratio shown in Fig. 4 and 5 is 20 DB greater than the number shown. However, since the instrument was sensitized by 20 DB, 20 DB was removed from the antenna published factor. This will now provide the correct radiated reading as the sum of the vertical antenna factor, the signal input attenuator and the meter indication.

Check by means of the tuning adjustment on the tuning unit that the desired signal produces maximum meter deflection. It may be necessary to change the input attenuator setting in order to achieve an "on scale" meter reading. If in tuning to the signal to be measured an appreciable departure from the original calibrating frequency was required, consult the calibration chart (Figure 1) and, if necessary, calibrate at the new frequency. Add to the sum of the meter and signal input attenuator readings(in DB) the antenna factor of Figure 4. The reading thus obtained in DB above one microvolt constitutes the antenna induced voltage.

*This step may be accomplished more conveniently by means of switching unit SU-105, available as an accessory item.

For measurement of broadband noise the substitution method (visual or aural) is used as described in the instruction manual for the NF-105. The readings of broadband noise are always in terms of DB above one microvolt per megacycle bandwidth. Add to the result of the substitution measurement the antenna factor in Figure 4, plus a constant of 20 DB.

When making broadband radiated measurements the substitution method must be employed. In this method the indication obtained from the unknown radiated signal is matched by the built-in impulse generator. The unknown radiated signal is picked up by the antenna then fed to the instrument through the antenna matching networks necessary to convert the antenna impedance. The substitution impulse generator signal however is fed directly to the input terminals of the instrument. The result of this is that the full transformation ratio of the antenna matching networks must be added to the impulse generator level in order to indicate the true radiated signal appearing at the antenna. It is for this reason that substitution measurements taken with Tuning Unit T-A/NF-105 require the addition of 20 DB to the antenna factor.

If for either CW or broadband noise measurements the loop antenna (LP-105) is to be employed, refer to Figure 5 for the proper antenna factor wherever Figure 4 is mentioned above.

For measurement of field strength in microvolts per meter refer to the next section.

5. Field strength measurements may be conducted by means of either the loop or the vertical antenna. Results obtained when using the loop antenna will be more accurate since they are essentially independent of ground consistency and height above ground. On the other hand a disadvantage of the loop antenna, especially at the lower frequencies, is its small effective height compared to that of the vertical antenna. For these reasons, use the loop antenna for field strength measurements whenever the signal level is sufficient to produce an adequate indication. Since the loop antenna is a directive device, it must be rotated for maximum pickup as indicated by the meter.

If a low signal level makes the use of the vertical antenna necessary, it is recommended that the antenna be located over the center of a network of wires placed on the ground and covering an area of approximately 800 square feet. The base of the antenna coupler must be connected to the ground network by a side bonding strap.

In spite of the precaution of spreading a ground wire network it is recommended that for greater accuracy, the vertical antenna be calibrated by means of the loop antenna at or near the frequency to be measured.

The calibration procedure is the same as that described in the previous section on radiated measurements. In order to obtain field strength in DB above one microvolt per meter, refer to Figure 4 for the vertical antenna and Figure 5 for the loop antenna. Add 6 DB (the effective height of a 41" rod) to the readings obtained using Figure 4.

6. Circuit Description

The frequency range of 0.150 MC to 30 MC is divided into six turret switched bands using IF frequencies of 0.455 and 1.600 MC. The proper intermediate frequency is chosen automatically by the bandswitching turret.

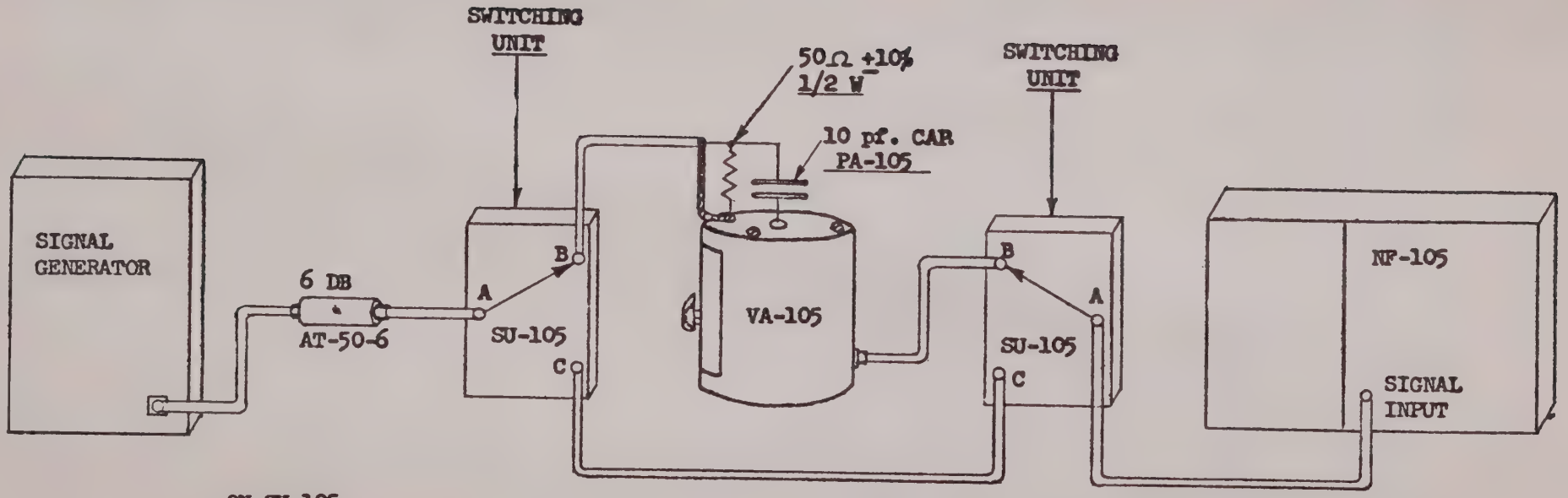
BAND	FREQUENCY	IF
1	0.150 to 0.360 MC	0.455 MC
2	0.360 to 0.870 MC	1.600 MC
3	0.870 to 2.1 MC	0.455 MC
4	2.1 to 5.2 MC	1.600 MC
5	5.2 to 12.5 MC	1.600 MC
6	12.5 to 30 MC	1.600 MC

The input signal, after passing through the signal input attenuator in the Basic Measuring Unit, is applied to a tuned circuit proceeding an RF Amplifier, using a type 5702 pentode. The signal is then fed to the tuned mixer stage employing a 5875 tube where it is mixed with the local oscillator voltage. The local oscillator employes a 5702 and operates above the signal frequency by an amount equal to the IF frequency. The resulting IF signal is amplified by the corresponding IF amplifier. Each IF amplifier consists of 4 double tubed stages using 6BJ6 tubes. A schematic diagram of Tuning Unit T-A/NF-105 is shown in Figure 6.

CALIBRATION SET-UP FOR VERTICAL ANTENNA VA-105

The test procedure used to determine the vertical antenna factor is shown on drawing #A9400.

The calibration charts furnished with our vertical antenna indicates the voltage transformation ratios vs. frequency of the antenna coupler. When the switching units are placed in position "C", the NF-105 reads the signal directly from a standard signal generator. When the switching units are placed in position "B", the NF-105 reads the signal after the transformation of the vertical antenna coupler. The difference between the reading obtained with the switches in positions "B" and "C" is the vertical antenna factor. The number thus obtained is the number shown on the vertical antenna charts + 20 DB. For instance, at 150 KC, the reading after the coupler will appear approximately 39 DB below that of the straight through setting.



ON SU-105:

A - CENTER CONNECTOR
B - LEFT CONNECTOR
C - RIGHT CONNECTOR

A 9400

CALIBRATION SET-UP FOR VERTICAL ANTENNA VA-105

PARTS LIST FOR TUNING UNIT
MODEL T-A/NF-105

I. CAPACITORS

Ref. Symbol	Description	Part Of
C700	5 - 25 mmf, ceramic trimmer	Tuned ckt.
C701	15 mmf, ceramic	"
C702	5 - 25 mmf, ceramic trimmer	"
C703	15 mmf, ceramic	"
C704	5 - 25 mmf, ceramic trimmer	"
C705	15 mmf, ceramic	"
C706	5 - 25 mmf ceramic trimmer	"
C707	15 mmf, ceramic	"
C708	5 - 25 mmf, ceramic trimmer	"
C709	15 mmf, ceramic	"
C710	5 - 25 mmf, ceramic trimmer	"
C711	15 mmf, ceramic	"
C712A	10-290 mmf, variable air	R.F.Tuner
C712B	10-290 mmf, variable air	"
C712C	10-290 mmf, variable air	"
C713	.01 mmf, 300V, ceramic disc	"
C714	1470 mmf, 2%, ceramic	"
C715	.01 mmf, 300V, ceramic disc	"
C716	.01 mmf, 300V, ceramic disc	"
C717	200 mmf, 5%, 500V dura mica	Tuned ckt.
C718	200 mmf, 5%, 500V, dura mica	"
C719	5 mmf, ceramic	"
C720	2 mmf, ceramic	"
C721	2 mmf, ceramic	"
C722	5-25 mmf, ceramic trimmer	"
C723	15 mmf, ceramic	"
C724	5-25 mmf, ceramic trimmer	"
C725	5 mmf, ceramic	"
C726	5-25 mmf, ceramic trimmer	"
C727	5 mmf, ceramic	"
C728	5-25 mmf, ceramic trimmer	"
C729	15 mmf, ceramic	"
C730	5-25 mmf, ceramic trimmer	"
C731	15 mmf, ceramic	"
C732	5-25 mmf, ceramic trimmer	"
C733	15 mmf, ceramic	"
C734	.01 mmf, 300V, ceramic disc	R.F.Tuner
C735	.01 mmf, 300V, ceramic disc	"
C736	.01 mmf, 300V, ceramic disc	"
C737	.01 mmf, 300V, ceramic disc	"
C738	5-25 mmf, ceramic trimmer	Tuned ckt.
C739	33 mmf, 5%, ceramic	"
C740	5-25 mmf, ceramic trimmer	"
C741	43 mmf, 2%, 500V, dura mica	"
C742	5-25 mmf, ceramic trimmer	"

I. CAPACITORS (continued)

Ref. Symbol	Description	Part of
C743	15 mmf, 5%, ceramic	"
C744	5-25 mmf, ceramic trimmer	"
C745	15 mmf, ceramic	"
C750	5-25 mmf, ceramic trimmer	"
C751	15 mmf, ceramic	"
C752	5-25 mmf, ceramic trimmer	"
C753	5 mmf, ceramic	"
C754	25 mmf, 500V, ceramic	R.F.Tuner
C755	25 mmf, 500V, ceramic	"
C756	118 mmf, 2%, 500V dura mica	Tuned ckt.
C757	80 mmf, 2%, 500V, dura mica	"
C758	540 mmf, 2%, 500V dura mica	"
C759	480 mmf, 2%, 500V, dura mica	"
C760	960 mmf, 2%, 500V, dura mica	"
C761	2020 mmf,2%, 500V dura mica	"
C762	.01 mmf, 300V, ceramic disc	R.F.Tuner
C763	.01 mmf, 300V, ceramic disc	"
C764	.47 mmf, 100V, electrolytic	"
C765	.47 mmf, 200V, electrolytic	"
C766	500 mmf, ceramic feed-thru	1.6 MC IF Amp.
C767	.001 mmf, 300V, ceramic disc	"
C768	250 mmf, 500V, dura mica	"
C769	.01 mmf, 300V, ceramic disc	"
C770	500 mmf, 500V, ceramic feed-thru	"
C771	.001 mmf, 300V, ceramic disc	"
C772	.01 mmf, 300V, ceramic disc	"
C773	.01 mmf, 300V, ceramic disc	"
C774	500 mmf, 500V, ceramic feed-thru	"
C775	250 mmf, 500V, dura mica	"
C776	250 mmf, 500V, dura mica	"
C777	.001mmf, 300V, ceramic disc	"
C778	.01 mmf, 300V, ceramic disc	"
C779	.001mmf, 300V ceramic disc	"
C780	.01 mmf, 300V, ceramic disc	"
C781	.01 mmf, 300V, ceramic disc	"
C782	500 mmf, 500V, ceramic feed-thru	"
C783	250 mmf, 500V, dura mica	"
C784	250 mmf, 500V, dura mica	"
C785	.001mmf, 300V ceramic disc	"
C786	.001mmf, 300V, ceramic disc	"
C787	.01 mmf, 300V, ceramic disc	"
C788	500 mmf, 500V, ceramic feed-thru	"
C789	250 mmf, 500V dura mica	1.6 MC IF Amp.
C790	250 mmf, 500V, dura mica	"
C791	.001mmf, 300V, ceramic disc	"
C792	.01 mmf, 300V, ceramic disc	"
C793	.01 mmf, 300V, ceramic disc	"
C794	500 mmf, 500V ceramic feed-thru	"

I. CAPACITORS (continued)

Ref. Symbol	Description	Part of
C795	.01 mmf, 300V ceramic disc	"
C796	200 mmf, 500V, dura mica	"
C797	500 mmf, 500V, ceramic feed thru	455 KC IF Amp.
C798	820 mmf, 500V, dura mica	"
C799	.001mmf, 300V, ceramic disc	"
C800	.01 mmf, 300V, ceramic disc	"
C801	500 mmf, 500V, ceramic feed-thru	"
C802	.001mmf, 300V, ceramic disc	"
C803	.01 mmf, 300V, ceramic disc	"
C804	.01 mmf, 300V, ceramic disc	"
C805	500 mmf, 500V ceramic feed-thru	"
C806	510 mmf, 500V, dura mica	"
C807	510 mmf, 500V, dura mica	
C808	.01 mmf, 300V, ceramic disc	"
C809	.001mmf, 300V, ceramic disc	"
C810	.001mmf, 300V, ceramic disc	"
C811	.01 mmf, 300V, ceramic disc	"
C812	.01 mmf, 300V, ceramic disc	"
C813	500 mmf, 500V, ceramic feed-thru	"
C814	510 mmf, 500V dura mica	"
C815	510 mmf, 500V, dura mica	"
C816	.001mmf, 300V, ceramic disc	"
C817	.01 mmf, 300V, ceramic disc	"
C818	.01 mmf 300V, ceramic disc	"
C819	500 mmf, 500V, ceramic feed-thru	"
C820	.01 mmf, 300V, ceramic disc	"
C821	510 mmf, 500V, dura mica	"
C822	510 mmf, 500V, dura mica	"
C823	.001mmf, 300V, ceramic disc	"
C824	.01 mmf, 300V, ceramic disc	"
C825	.01 mmf, 300V ceramic disc	"
C826	500 mmf, 500V, ceramic feed-thru	"
C827	.01 mmf, 300V, ceramic disc	"
C828	510 mmf, 500V dura mica	"
C829	.01 mmf, 300V ceramic	"
C830	.01 mmf, 300V, ceramic	1.6 MC IF Amp.
C831	.01 mmf, 300V ceramic	455 KC IF Amp.
C832	500 mmf, 500V, ceramic feed-thru	"
C833	500 mmf, 500V, ceramic feed-thru	1.6 MC IF Amp.

II. JACKS

Ref. Symbol	Description	Part of
J700	UG-291/U	Ant. Conn.
J701	Connector, Coaxial; Type MB	455 KC IF
J702	Connector, Coaxial; Type MB	1.6 MC IF
J703	Connector, Coaxial; Type MB	R.F. Input
J704	Connector, Coaxial; Type MB	Switching Box IF
J705	Connector, Female; Coaxial Plug-In	IF Output
J706	Connector, Coaxial; Type MB	455 KC IF
J707	Connector, Coaxial; Type MB	1.6 MC IF

III. INDUCTORS

Ref. Symbol	Description	Part of
L700	Input choke	1.6 MC IF
L701	Input choke	455 KC IF
L702	Cathode coil	R.F. Tuner
L703	Filament choke	"
L704	Filament choke	"
L705	Filament choke	"
L706	Filament choke	1.6 MC IF
L707	Filament choke	"
L708	Filament choke	"
L709	Filament choke	455 KC IF
L710	Filament choke	"
L711	Filament choke	"

IV. PILOT LAMPS

Ref. Symbol	Description	Part of
LP700	Lamp No. 47	R.F. Tuner
LP701	Lamp No. 47	"

V. CONNECTORS

Ref. Symbol	Description	Part of
P701	Plug, Coaxial; Type MB	455 KC IF
P702	Plug, Coaxial; Type MB	1.6 MC IF
P703	Plug, Coaxial; Type MB	R.F. Input
P704	Plug, Coaxial; Type MB	IF Output
P706	Plug, Coaxial; Type MB	455 KC IF
P707	Plug, Coaxial; Type MB	1.6 MC IF
P708	Connector; Pin, Female	Main unit plug

VI. RESISTORS

Ref. Symbol	Description	Part of
R700	36 ohms, 1/2 w, 5% carbon	Tuned Ckt.
R701	150 ohms, 1/2 w,10% carbon	"
R702	150 ohms, 1/2 w,10% carbon	"
R703	150 ohms, 10%, ½w, carbon	R.F.Tuner
R704	10K ohms, 10%, ½w, carbon	"
R705	1K ohms, 10%, ½w, carbon	"
R706	220 ohms, 10%, ½w, carbon	"
R707	220 ohms, 10%, ½w, carbon	"
R708	10K ohms, 10%, ½w, carbon	"
R709	220K ohms, 10% ½w, carbon	"
R710	470 ohms, 10%, ½w, carbon	"
R711	22K ohms, 10%, ½w, carbon	"
R712	1K ohms, 10%, ½w, carbon	Tuned ckt.
R713	1.5K ohms, 10% ½w, carbon	"
R714	1.5K ohms, 10%, ½w, carbon	"
R715	1.5K ohms, 10%, ½w, carbon	"
R716	1.2K ohms, 10%, ½w, carbon	"
R718	150 ohms, 10%, ½w, carbon	R.F.Tuner
R719	4.7K ohms, 10%, 2w, carbon	"
R720	150 ohms, 10% 2w, carbon	"
R721	1M ohms, 10%, ½w, carbon	1.6 MC IF
R722	100K ohms, 10%, ½w, carbon	"
R723	1K ohms, 10%, ½w, carbon	"
R724	390 ohms, 10%, ½w, carbon	"
R725	1M ohms, 10%, ½w, carbon	"
R726	47K ohms, 10%, ½w, carbon	"
R727	1K ohms, 10%, ½w, carbon	"
R728	390 ohms, 10%, ½w, carbon	"
R729	47K ohms, 10%, ½w, carbon	"
R730	1M ohms, 10%, ½w, carbon	"
R731	220K ohms, 10%, ½w, carbon	"
R732	470 ohms, 10%, ½w, carbon	"
R733	390 ohms, 10%, ½w, carbon	"
R734	47K ohms, 10%, ½w, carbon	"
R735	470 ohms, 10%, 1w, carbon	"
R736	680 ohms, 10%, ½w, carbon	"

VI. RESISTORS (continued)

Ref. Symbol	Description	Part Of
R737	15K ohms, 10%, ½w, carbon	1.6 MC IF
R738	150 ohms, 10% ½w, carbon	+150 V line
R739	7.5K ohms, 10 w, wire wound	"
R740	100K ohms, 10%, ½w, carbon	455 KC IF
R741	1M ohms, 10%, ½w, carbon	455 KC IF
R742	1K ohms,10%, ½w, carbon	"
R743	100 ohms,10%, ½w, carbon	"
R744	22K ohms,10%, ½w, carbon	"
R745	1M ohms,10%, ½w, carbon	"
R746	15K ohms,10%, ½w, carbon	"
R747	15K ohms,10%, ½w, carbon	"
R748	1K ohms,10%, ½w, carbon	"
R749	100 ohms, 10%,½w, carbon	"
R750	22K ohms,10%, ½w, carbon	"
R751	15K ohms,10%, ½w, carbon	"
R752	470 ohms,10%, ½w, carbon	"
R753	15k ohms, 10%,½w, carbon	"
R754	100 ohms,10%,½w, carbon	"
R755	22K ohms,10%, ½w, carbon	"
R756	15K ohms, 10%,½w, carbon	"
R757	15K ohms, 10%,½w, carbon	"
R758	470 ohms, 10%, 1w, carbon	"
R759	680 ohms, 10%, ½w, carbon	"
R760	15K ohms, 10%, ½w, carbon	"
R761	470 ohms, 10%, ½w, carbon	"
R762	100K ohms, 10%, ½w, carbon	"
R763	100K ohms, 10%, ½w, carbon	1.6 MC IF
R764	100K ohms, 10%, ½w, carbon	"
R765	100K ohms, 10%, ½w, carbon	"
R766	100K ohms, 10%, ½w, carbon	"
R767	100K ohms, 10%, ½w, carbon	"
R768	100K ohms, 10%, ½w, carbon	"
R769	4.7K ohms, 10%, ½w, carbon	Tuned ckt.
R770	47 ohms, 10%, ½w, carbon	R.F.Tuner
R771	1.5K ohms, 10%, ½w, carbon	Tuned ckt.
R772	47K ohms, 10%, ½w, carbon	455 KC IF
R773	47K ohms, 10%, ½w, carbon	"
R774	47K ohms, 10%, ½ w, carbon	"

VII. SWITCHES

Ref. Symbol	Description	Part of
S701	SPDT	R.F. Tuner
S702	Wafer Switch, 3PDT, 2 Section, #A6387	IF Amplifier

VII. TRANSFORMERS

Ref. Symbol	Description	Part of
T700	IF transformer, A6078	1.6 MC IF
T701	IF transformer, A6078	"
T702	IF transformer, A6078	"
T703	IF transformer, A6076	"
T704	IF transformer, A6077	455 KC IF
T705	IF transformer, A6077	"
T706	IF transformer, A6077	"
T707	IF transformer, A6075	"
T708	Input transformer	Tuned ckt.
T709	Input transformer	"
T710	Input transformer	"
T711	Input transformer	"
T712	Input transformer	"
T713	Input transformer	"
T714	Input transformer	"
T715	Input transformer	"
T716	Input transformer	"
T717	Input transformer	"
T718	Input transformer	"
T719	Input transformer	"
T720	Input transformer	"
T721	Input transformer	"
T722	Input transformer	"
T723	Input transformer	"
T724	Input transformer	"
T725	Input transformer	"

IX. TUBES

Ref. Symbol	Description	Part of
V700	5702	R.F. ckt.
V701	5784	"
V702	5702	"
V703	6BJ6	1.6 MC IF
V704	6BJ6	"
V705	6BJ6	"
V706	6BJ6	"
V707	6BJ6	455 KC IF
V708	6BJ6	"
V709	6BJ6	"
V710	6BJ6	"

CALIBRATION CHART FOR TUNING UNIT T-A/NF-105

SERIAL NO.

FREQ. (MC)	IMPULSE GEN. LEVEL IN DB ABOVE 1 uv/MC	FREQ. (MC)	IMPULSE GEN. LEVEL IN DB ABOVE 1 uv/MC	FREQ. (MC)	IMPULSE GEN. LEVEL IN DB ABOVE 1 uv/MC
.150		.870		5.2	
.174		.900		6.0	
.200		1.0		7.0	
.225		1.1		8.0	
.250		1.3		9.0	
.275		1.5		10.0	
.300		1.7		11.0	
.325		1.9		12.0	
.360		2.1		12.7	
.360		2.1		12.7	
.400		2.4		15.0	
.450		2.7		19.0	
.500		3.0		21.0	
.560		3.4		24.0	
.620		3.7		27.0	
.700		4.0		30.0	
.760		4.4			
.820		4.7			
.870		5.2			

FIGURE 1

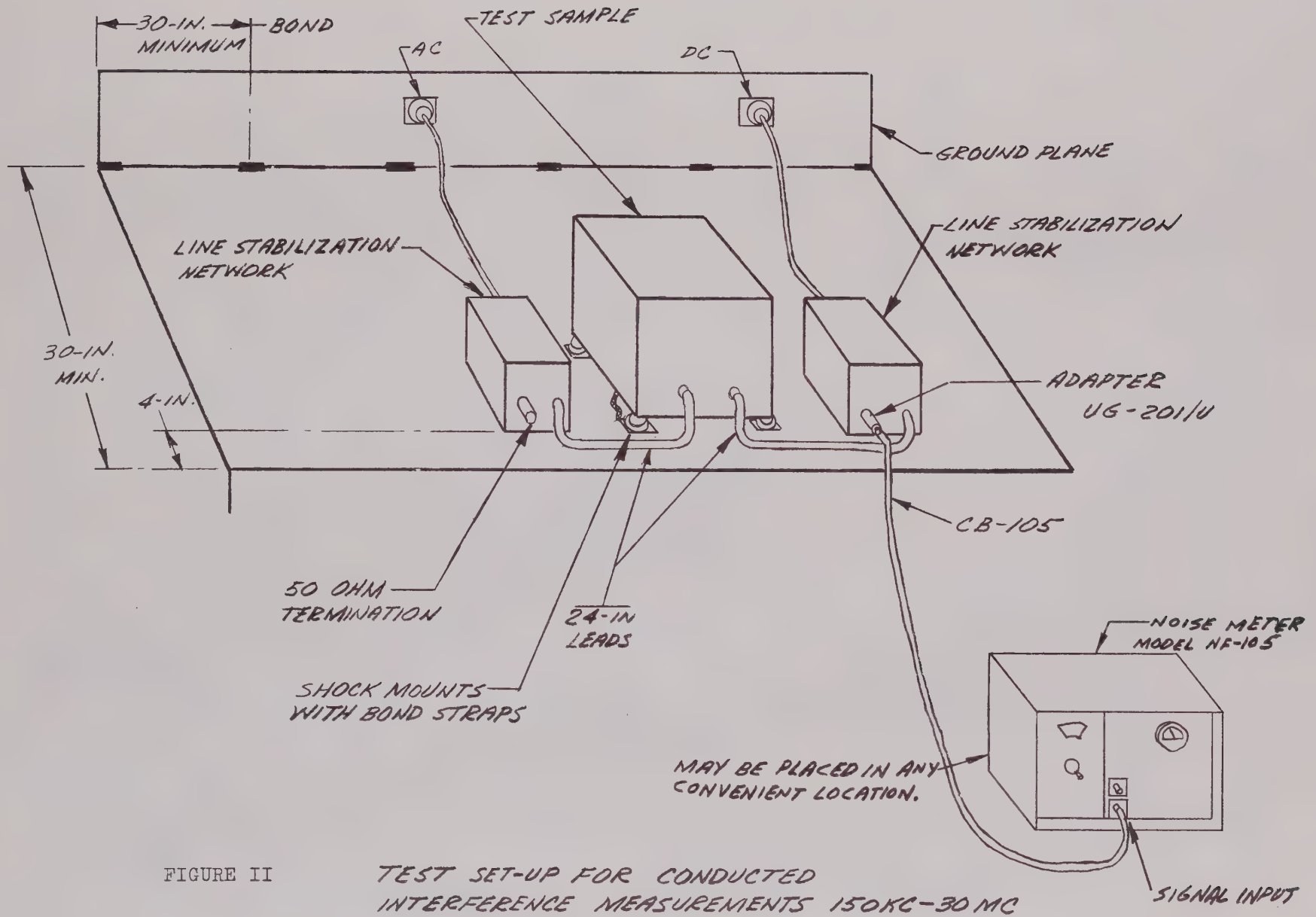


FIGURE II TEST SET-UP FOR CONDUCTED INTERFERENCE MEASUREMENTS 150KC-30 MC

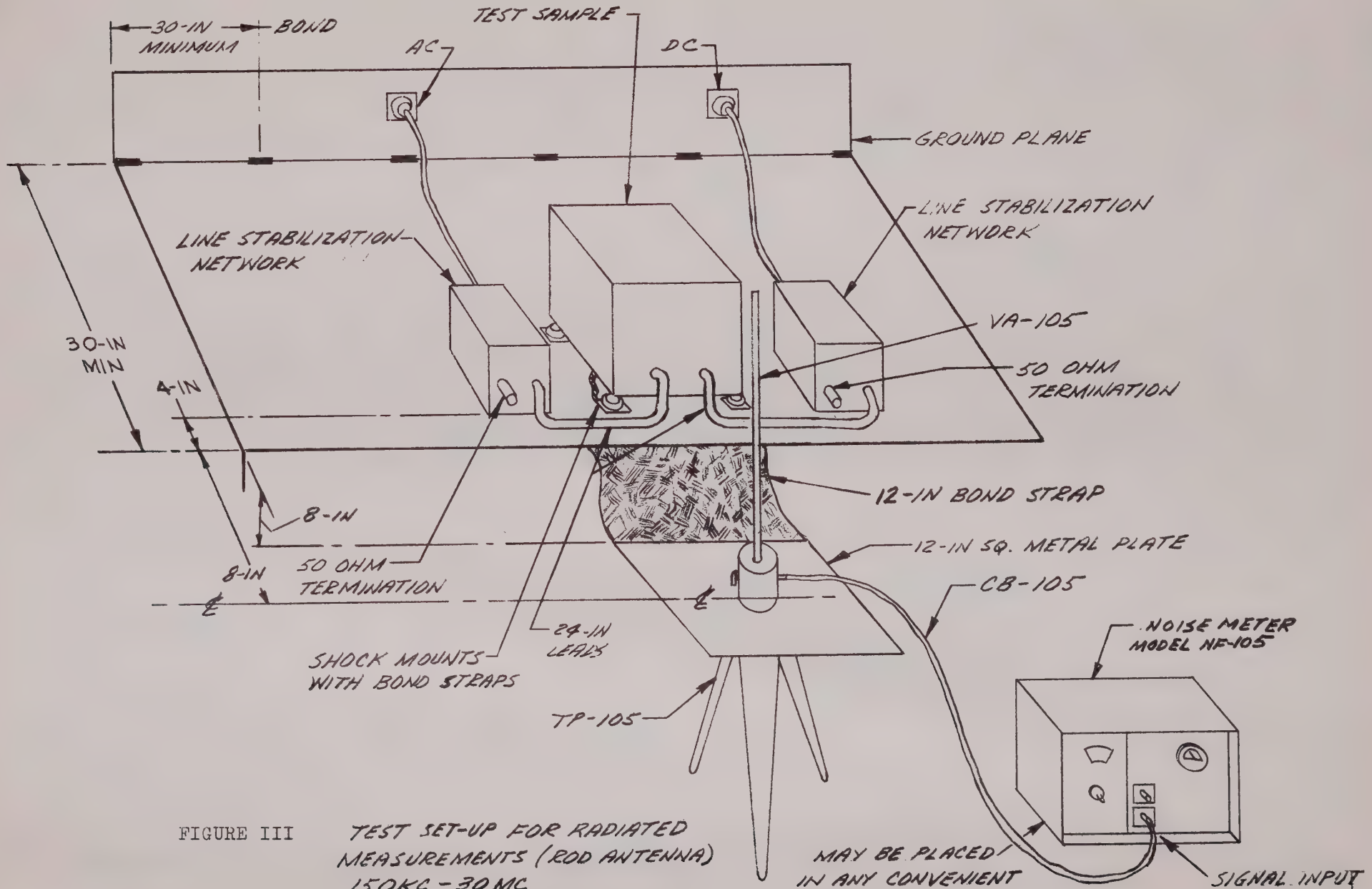


FIGURE III TEST SET-UP FOR RADIATED MEASUREMENTS (ROD ANTENNA) 150KC - 30MC

UNIT #

SERIAL NO.

ANTENNA FACTOR FOR VERTICAL ANTENNA VA-105

BAND	FREQUENCY MC	DB
1	.150	
	.230	
	.260	
	.300	
	.330	
	.360	
2	.360	
	.400	
	.500	
	.600	
	.700	
	.800	
	.870	
3	.870	
	1.0	
	1.2	
	1.4	
	1.6	
	1.8	
	2.1	

BAND	FREQUENCY MC	DB
4	2.1	
	2.7	
	3.4	
	4.0	
	4.6	
	5.2	
5	5.2	
	6.0	
	7.0	
	8.0	
	9.0	
	10.0	
	11.0	
	12.7	
6	12.7	
	14.0	
	17.0	
	20.0	
	23.0	
	26.0	
	28.0	
	30.0	

FOR SUBSTITUTION MEASUREMENTS ADD 20 DB TO THE ABOVE FACTORS

+6 c

FIGURE IV

ANTENNA "FACTOR" FOR

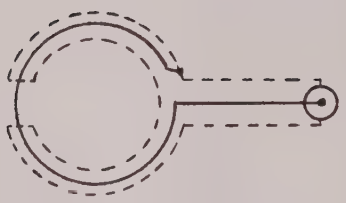
LOOP ANTENNA LP - 105

FREQUENCY	DB	FREQUENCY	DB
150 KC	41.0	2.4 MC	27.8
175 KC	40.0	2.7 MC	27.3
200 KC	39.5	3.0 MC	27.0
225 KC	38.8	3,4 MC	26.6
250 KC	38.3	3.7 MC	26.1
275 KC	37.8	4.0 MC	25.9
300 KC	37.3	4.4 MC	25.5
325 KC	36.9	4.7 MC	25.3
360 KC	36.5	5.2 MC	25.1
400 KC	36.5	6.0 MC	24.0
450 KC	36.0	7.0 MC	23.0
500 KC	35.5	8.0 MC	22.0
560 KC	35.0	9.0 MC	21.2
620 KC	34.4	10.0 MC	20.8
700 KC	34.0	11.0 MC	20.3
760 KC	33.5	12.0 MC	20.0
820 KC	33.0		
870 KC	32.8	12.7 MC	19.8
		15.0 MC	19.3
900 KC	32.5	19.0 MC	19.0
1000 KC	31.8	21.0 MC	18.6
1.1 MC	31.0	24.0 MC	18.4
1.3 MC	30.2	27.0 MC	18.2
1.5 MC	29.8	30.0 MC	18.0
1.7 MC	29.3		
1.9 MC	29.2		
2.1 MC	29.0		

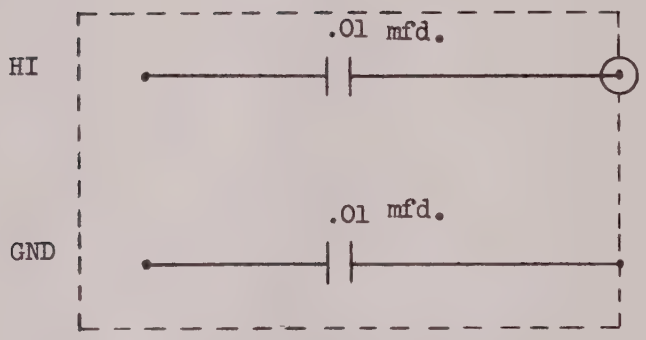
FOR SUBSTITUTION MEASUREMENTS ADD 20 DB TO THE ABOVE FACTORS

REVISED DATE
JANUARY 6, 1964

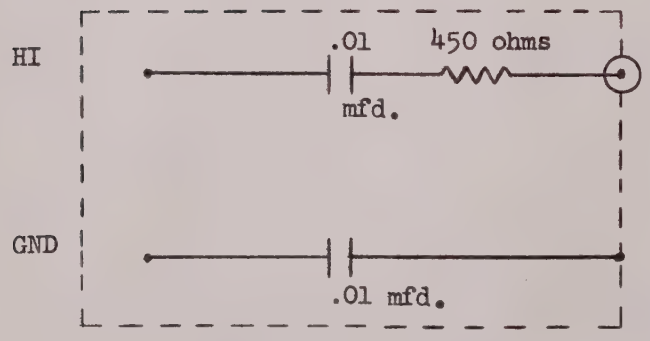
FIGURE V



Magnetic Field Probe (Red)
LO-105



Line Probe - 50 ohms
LA-105



Line Probe - 500 ohms
LF-105

Figure VI
Schematic Diagram
150 KC - 30 MC Probes
(Part of Antenna
Equipment LM-105)

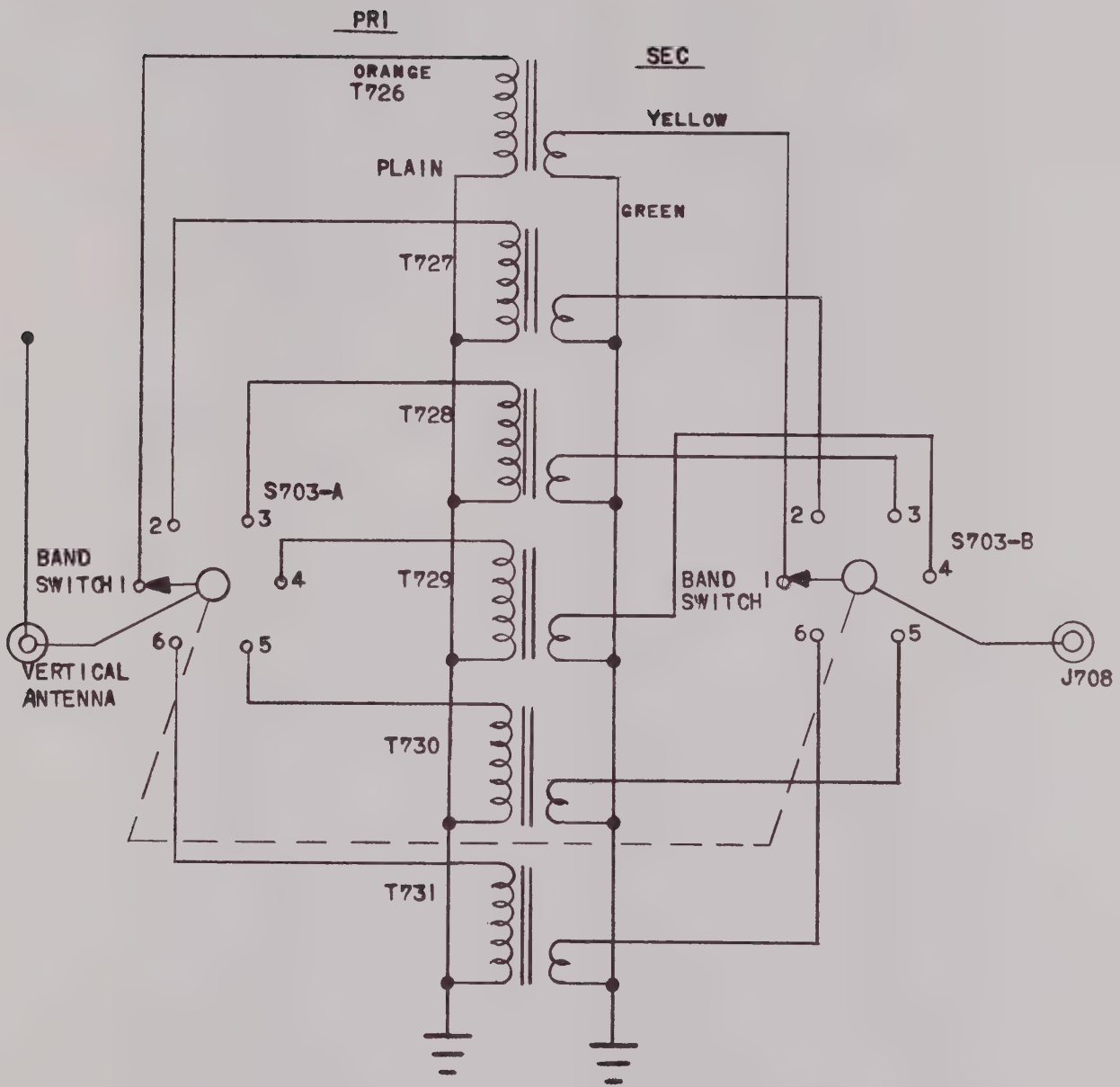


FIGURE VII
SCHEMATIC - VERTICAL ANTENNA
VA- 105

A-6467

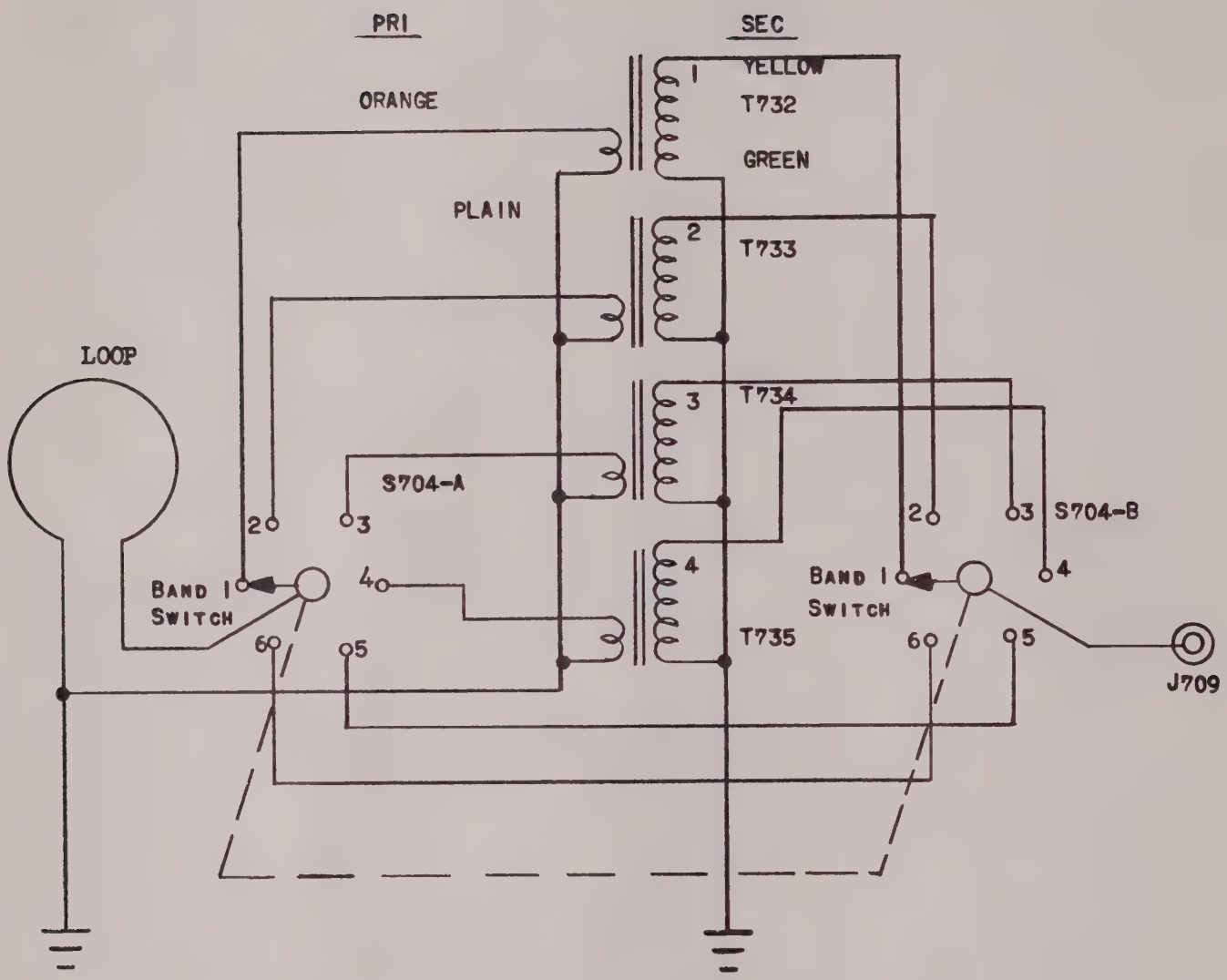


FIGURE VIII
SCHEMATIC - LOOP ANTENNA
LP - 105

A-6466

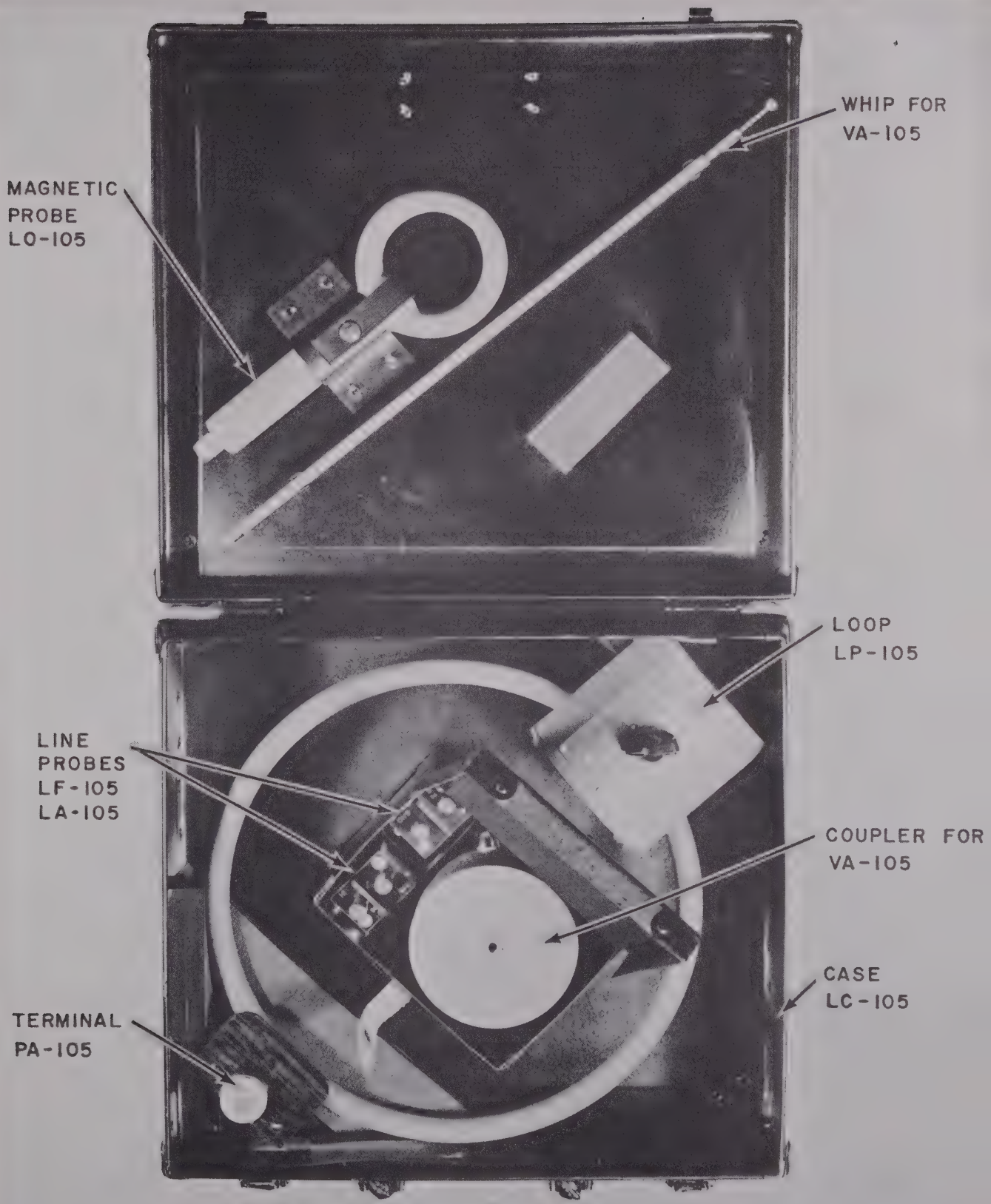
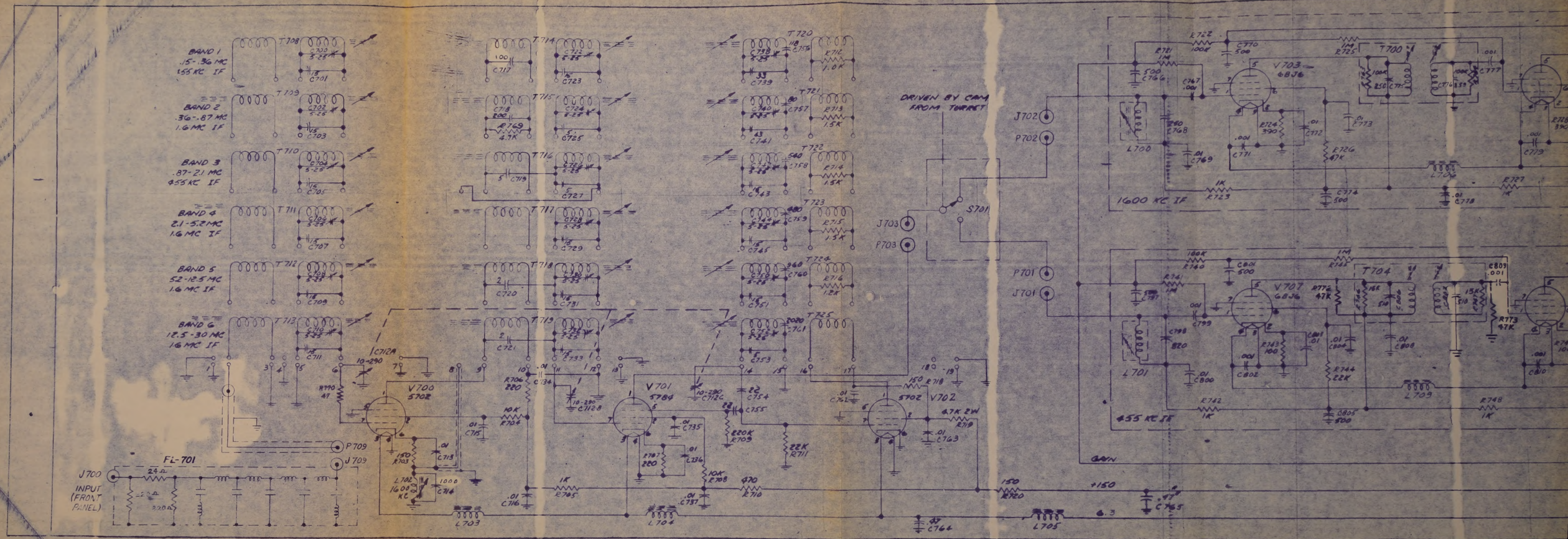


FIGURE IX. ARRANGEMENT OF COMPONENTS IN LM-105


BAND 1
.15 - 36 MC
455 KC IF
BAND 2
.36 - .87 MC
1.6 MC IF
BAND 3
.87 - 2.1 MC
455 KC IF
BAND 4
2.1 - 5.2 MC
1.6 MC IF
BAND 5
5.2 - 12.5 MC
1.6 MC IF
BAND 6
12.5 - 30 MC
1.6 MC IF
DRIVEN BY CAM FROM TURRET
S701
J702
P702
J703
P703
P701
J701
V700
5702
V701
5784
V702
5702
V703
6BJ6
V707
6BJ6
T700
T704
L700
L701
L702
1600 KC
L703
L704
L705
L709
1600 KC IF
455 KC IF
GAIN
FL-701
J700
INPUT
(FRONT
PANEL)
P709
J709
+150
6.3